

QUICK RELEASE ASSEMBLY

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1 QUICK RELEASE ASSEMBLY

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4 Field of the Invention

5  
6 This invention relates to quick release assemblies for  
7 attaching a removable part to a frame and to quick release  
8 hub assemblies for bicycles.

9  
10 Background of the Invention

11  
12 Many road and mountain bikes incorporate wheels having  
13 hubs that are furnished with quick release assemblies that  
14 are useful for quickly attaching and detaching the wheels to  
15 and from the bicycle frame. Quick release assemblies are  
16 also utilized for seat posts and other removable components  
17 of bicycles. Most quick release assemblies incorporate a  
18 hand-operated lever that interacts with a cam, securing and  
19 releasing, for instance, the hub to and from the fork of a  
20 bicycle frame in response to operation of the lever.  
21 Because quick release assemblies allow removable components  
22 such as wheels to be removed from a bicycle frame very  
23 quickly, such removable components, especially wheels, are  
24 often stolen. Although skilled artisans have devoted  
25 considerable effort toward improving the structure and

1 function of quick release assemblies, relatively little  
2 effort has been directed toward quick release assemblies  
3 that are designed to resist unwanted and unauthorized  
4 operation.

5

6 Thus, there is a need for a new and improved quick  
7 release assembly that is easy to make, easy to use,  
8 inexpensive and highly efficient and that incorporates  
9 unique features that prevent unwanted and unauthorized  
10 operation.

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1 reciprocating in the cap, and one of the ends of the cam  
2 includes a keyway that is capable of receiving the key. The  
3 device includes a catch assembly that is capable of catching  
4 the key to the keyway. The catch assembly includes a  
5 protuberance carried by the cam at the keyway and a  
6 detachably engageable recess carried by the key, and this  
7 arrangement can be reversed. The protuberance is biased  
8 into the keyway and the keyway is eccentric relative to the  
9 cam. Further to this embodiment, the hub is also attached  
10 to a wheel and to a bicycle frame.

11  
12 Yet another preferred embodiment of the invention is a  
13 device that includes a handle having a key and a piston that  
14 is attached to an axle reciprocated to a hub attached to a  
15 bicycle wheel. A bore passes through the piston. A cam  
16 includes ends that are held by a cap for rotation in the  
17 bore. The piston is capable of reciprocating in the cap,  
18 and one of the ends of the cam includes a keyway that is  
19 capable of receiving the key. The device includes a catch  
20 assembly that is capable of catching the key to the keyway.  
21 The catch assembly includes a protuberance carried by the  
22 cam at the keyway and a detachably engageable recess carried  
23 by the key, and this arrangement can be reversed. The  
24 protuberance is biased into the keyway and the keyway is

1 eccentric relative to the cam. Further to this embodiment,  
2 the hub is also attached to a bicycle frame.

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4 A further preferred embodiment of the invention is a  
5 device that includes a handle having a key and a piston  
6 having a bore. A cam includes ends that are held by a cap  
7 for rotation in the bore. The piston is capable of  
8 reciprocating in the cap, and one of the ends of the cam  
9 includes a keyway that is capable of receiving the key. The  
10 device includes a catch assembly that is capable of catching  
11 the key to the keyway. In this embodiment, the catch  
12 assembly is a magnetic attraction between the cam and the  
13 key. The cam is fabricated of magnetic material and the key  
14 is fabricated of iron or steel and this can be reversed.  
15 The cam and the key can each be fabricated of magnets if  
16 desired. Further to this embodiment, the piston is attached  
17 to a hub, which is attached to a wheel and to a bicycle  
18 frame.

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20 Yet a further preferred embodiment of the invention is  
21 a device that includes a handle having a key and a piston  
22 that is attached to an axle reciprocated to a hub. A bore  
23 extends through the piston. A cam includes ends that are  
24 held by a cap for rotation in the bore. The piston is  
25 capable of reciprocating in the cap, and one of the ends of

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1 the cam includes a keyway that is capable of receiving the  
2 key. The device includes a catch assembly that is capable  
3 of catching the key to the keyway. In this embodiment, the  
4 catch assembly is a magnetic attraction between the cam and  
5 the key. The cam is fabricated of magnetic material and the  
6 key is fabricated of iron or steel and this can be reversed.  
7 The cam and the key can each be fabricated of magnets if  
8 desired. Further to this embodiment, the hub is also  
9 attached to a wheel and to a bicycle frame.

10

11 Still a further preferred embodiment of the invention  
12 is a device that includes a handle having a key and a piston  
13 that is attached to an axle reciprocated to a hub that is  
14 attached to a bicycle wheel. A bore extends through the  
15 piston. A cam includes ends that are held by a cap for  
16 rotation in the bore. The piston is capable of  
17 reciprocating in the cap, and one of the ends of the cam  
18 includes a keyway that is capable of receiving the key. The  
19 device includes a catch assembly that is capable of catching  
20 the key to the keyway. In this embodiment, the catch  
21 assembly is a magnetic attraction between the cam and the  
22 key. The cam is fabricated of magnetic material and the key  
23 is fabricated of iron or steel and this can be reversed.  
24 The cam and the key can each be fabricated of magnets if

1 desired. Further to this embodiment, the hub is also  
2 attached to a bicycle frame.

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BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings:

FIG. 1 is a perspective view of a quick release assembly, in accordance with the principle of the invention, the quick release assembly disposed with a hub that is attached to a wheel and to a frame, each partially depicted;

FIG. 2 is a sectional view of the quick release assembly of FIG. 1, the quick release assembly including a handle having a key, a piston having a bore and a cam held by a cap for rotation in the bore and having a keyway that is capable of receiving the key;

FIG. 3 is an exploded perspective view of the quick release assembly of FIGS. 1 and 2;

FIG. 4 is a side elevation of the handle of FIG. 3, the opposite side elevation being a mirror image thereof;

FIG. 5 is a bottom plan of the handle of FIG. 3;

1 FIG. 6 is an exploded perspective view of the cam of  
2 FIG. 3 depicting elements of a catch assembly of the  
3 invention;

4  
5 FIG. 7 is an exploded perspective view of the elements  
6 of the catch assembly depicted in FIG. 6;

7  
8 FIG. 8 is a top plan of the cam of FIG. 3;

9  
10 FIG. 9 is a side elevation of the cam of FIG. 3;

11  
12 FIG. 10 is a bottom plan of the cam of FIG. 3;

13  
14 FIG. 11 is an enlarged partial perspective view of the  
15 handle of FIG. 3 illustrating the key;

16  
17 FIG. 12 is a perspective view of another embodiment of  
18 a quick release assembly, in accordance with the principle  
19 of the invention;

20  
21 FIG. 13 is a sectional view of the quick release  
22 assembly of FIG. 12;

1        FIG. 14 is a fragmented perspective view of yet another  
2        embodiment of a quick release assembly, in accordance with  
3        the principle of the invention; and

4

5        FIG. 15 is a sectional view of a cam of the quick  
6        release assembly of FIG. 14 with a key of a handle thereof  
7        depicted adjacent the cam.

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1 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

2  
3 Turning now to the drawings, in which like reference  
4 characters indicate corresponding elements throughout the  
5 several views, attention is first directed to FIG. 1 in  
6 which is seen a perspective view of a quick release assembly  
7 20, embodying the principle of the invention. Assembly 20  
8 is disposed with a hub 21 that is attached to a wheel 22 and  
9 to a fork 23 of a frame 24, each partially depicted. In  
10 FIG. 1, frame 24 is a bicycle frame of a bicycle, fork 23 is  
11 the front fork of frame 24 and wheel 22 is the front wheel  
12 of the bicycle. Hub 21 is attached to spokes 25 of wheel 22  
13 in a conventional manner.

14  
15 Looking to FIGS. 2 and 3, assembly 20 includes handle  
16 30 having a key 31, a piston 32 having a bore 40, a cap 34  
17 having an open end 34A and a closed end 34B, a cam 33 held  
18 by cap 34 for rotation in bore 40 and having a keyway 56  
19 that is capable of receiving key 31, and a catch assembly 70  
20 (FIG. 3). FIG. 4 is a side elevation of handle 30, the  
21 opposite side elevation being a mirror image thereof. FIG.  
22 5 is a bottom plan of handle 30. With specific regard to  
23 FIG. 2, a hollow axle 35 extends through hub 21. A nut 36  
24 threadably secures axle 35 to hub 21, and assembly 20  
25 attaches to axle 35 immediately adjacent fork 23. Open end

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1 34A of cap 34 is directed toward fork 23, and closed end 34B  
2 of cap 34 is directed away from fork 23. An axle 37 is  
3 slideably disposed through axle 35 and, in this embodiment,  
4 is attached to piston 32. Axle 37 is capable of  
5 reciprocating through axle 35 and is considered reciprocated  
6 to hub 21. Because axle 37 is reciprocated to hub 21,  
7 piston 32 is also considered reciprocally mounted. Although  
8 not shown, axle 37 extends through and slightly beyond axle  
9 35, and a nut threadably secures this exposed end of axle 37  
10 to fork 23. Bore 40 extends through piston 32 and cap 34  
11 fits over and surrounds piston 32. Cam 33 is rotatably  
12 disposed through bore 40 and is rotated to cap 34. Included  
13 in cam 33 is a cam body 45 that is rotatably disposed  
14 through bore 40 of piston 32. The outer diameter of cam  
15 body 45 that extends through bore 40 is slightly less than  
16 the inner diameter of bore 40, and this permits cam body 45  
17 to rotate within bore 40. Cam body 45 has opposing ends  
18 50,51 disposed on either side of piston 32 that are held by  
19 cap 34 for rotation. End 50 extends into and is held for  
20 rotation by an opening 52 of cap 34 and end 51 extends into  
21 and is held for rotation by a recess 53 of cap 34 opposing  
22 opening 52. End 51 can be fashioned with a recess and cap  
23 34 can be fashioned with an extension or protuberance for  
24 rotatably accommodating the recess of end 51 if desired. A  
25 clamp 58 located adjacent the underside of piston 32

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1 attaches and secures an annular groove 59 formed into cam 33  
2 proximate end 51, which, in cooperation with piston 32,  
3 secures piston 33 to cap 34 preventing it from discharging  
4 through opening 52.

5

6 End 50 of cam 33 is cylindrical and enlarged relative  
7 to cam body 45, and this is readily visualized in FIGS. 2  
8 and 3. End 50 is capable of being rotated in opening 52 and  
9 defines an axis of rotation A (FIGS. 2,9,10) that is  
10 substantially concentric with the geometric center of  
11 opening 52 (FIG. 2). Keyway 56 extends into end 50 and  
12 defines a geometric center that is substantially concentric  
13 with axis of rotation A, as defined by end 50. Accordingly,  
14 the geometric center of keyway 56 is eccentric to cam body  
15 45 and, more particularly, to axis of rotation B. End 50 is  
16 considered a key receiving member of cam 33. Cam body 45 is  
17 capable of being rotated in bore 40 at its axis of rotation  
18 B (FIGS. 2,9,10), which is substantially concentric with the  
19 geometric center of bore 40 and eccentric to the geometric  
20 center of opening 52. As a result, the geometric center of  
21 bore 40 is eccentric to the geometric center of opening 52.  
22 A spring 60 is located between fork 23 and piston 32,  
23 encircles axle 37 and biases piston 32 away from fork 23 and  
24 otherwise toward cap 34.

1 To secure wheel 22 to fork 23, a cyclist takes up  
2 handle 30 and inserts key 31 into keyway 56 of cam 33 as  
3 shown in FIG. 2. Rotation of handle 30 rotates cam 33  
4 rotating cam body 45 within bore 40 of piston 32 causing  
5 piston 32, cam 33 and cap 34 to move. By selectively  
6 rotating cam 33, assembly 20 is capable of being moved  
7 between an open position releasing fork 23 and a closed  
8 position securing fork 23. In the open position of assembly  
9 20, cap 34 is disposed away from fork 23 allowing removal of  
10 wheel 22. In the closed position of assembly 20, end 34A of  
11 cap 34 bears tightly up against fork 23 preventing removal  
12 of wheel 22.

13  
14 Handle 30 is not provided with an attached cam as with  
15 prior art quick release assemblies, but is provided with key  
16 31, which permits handle 30 to function not only to rotate  
17 cam 33 as previously explained but also to lock assembly 20  
18 to prevent the likelihood of theft of wheel 22. With regard  
19 to FIG. 11, key 31 demonstrates a specific shape and keyway  
20 56 (FIGS. 3,9) is correspondingly shaped to accept key 31.  
21 Key 31 and keyway 56 can embody a potentially infinite  
22 variety of complementing shapes. In the immediate  
23 embodiment, a central blind bore 62 extends into key 31,  
24 which is capable of accepting a guide pin 63 disposed  
25 centrally of keyway 56.

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1 When assembly 20 is in its closed position securing  
2 fork 23, removing handle from assembly 20 prevents wheel 22  
3 from be stolen because unless one has a handle with a  
4 duplicate key rotation of cam 33 is not possible and removal  
5 of wheel 22 becomes extremely difficult if not impossible.  
6 Handle 30 usually removed from assembly 20 when the bicycle  
7 is unattended. When the bicycle incorporating assembly 20  
8 is in use, most cyclists prefer to keep handle 30 attached  
9 to assembly 20. However, it has been noticed that because  
10 there is nothing locking handle 30 to assembly 20, handle 30  
11 is free to fall away from assembly 20, causing it to be  
12 lost. In accordance with the principle of the invention,  
13 key 31 and cam 33 are furnished with catch assembly 70,  
14 which locks key 31 to keyway 56, preventing key 31 from  
15 inadvertently falling away from keyway 56 except with a  
16 force that is sufficient to overcome the locking action of  
17 catch assembly 70.

18  
19 In the immediate embodiment, catch assembly 70 includes  
20 a protuberance 71 (FIGS. 6-8) carried by cam 33 and a  
21 detachably engageable recess 72 (FIGS. 3,4,11) carried by  
22 key 31. Regarding FIG. 6, a bore 73 extends through end 50  
23 of cam 33 to an opening 74 (FIG. 8) leading to keyway 56.  
24 Protuberance 71 is located at opening 74, and although  
25 opening permits protuberance 71 to extend partially into



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1 keyway 56 as depicted in FIG. 8, opening 74 is too small to  
2 permit protuberance to fall away from bore 74 into keyway  
3 56. A spring 75 is captured in bore 73 between protuberance  
4 71 and a nut threadably attached to the outer opening  
5 leading to bore 73. Spring 75 bears against nut 76 and  
6 protuberance 71 and biases protuberance toward or otherwise  
7 into keyway 56. Key 31 encounters protuberance 71 when  
8 inserted into keyway 56. Exerting a force against key 31  
9 toward keyway 56 that is sufficient to overcome the bias of  
10 spring 75 allows key 31 to push protuberance 71 away from  
11 keyway 56 forcing it into bore 73 allowing key 31 to pass  
12 thereby into keyway 56 until the point when protuberance 71  
13 encounters recess 72. When protuberance 71 encounters  
14 recess 72, the bias provided by spring 75 forces  
15 protuberance 71 into engagement into and against recess 72  
16 securing key 31 to cam 33, securing handle 30 to cam 33 to  
17 prevent handle 30 from inadvertently falling away from cam  
18 30. In this way, a bicycle incorporating assembly 20 can be  
19 used and ridden with handle 30 attached without risk of  
20 handle 30 inadvertently becoming detached from cam 33. The  
21 only way to remove handle 30 is to reverse the foregoing  
22 operation by taking up handle 30 and pulling on it with a  
23 force that is sufficient 31 to overcome the bias provided by  
24 spring 75, detaching protuberance 71 from recess 72. The  
25 positioning of protuberance 71 and recess 72 can be

1 reversed, with recess 72 carried by cam 33 at keyway 56 and  
2 protuberance 71 carried by key 31 in a fashion like that of  
3 cam 33 so as to extend outwardly of, and be biased away  
4 from, key 31. Also, although only one protuberance and  
5 complementing recess are immediately depicted, any  
6 reasonable number of protuberances and complementing  
7 recesses can be employed if desired.

8

9 In sum, when key 31 is inserted into keyway 56 and  
10 protuberance 71 engages recess 72, handle 30 is prevented  
11 from falling out of assembly 20. Accordingly, a cyclist can  
12 use the bicycle with handle 30 in place. When the cyclist  
13 wants to park the bicycle and remove the front wheel, handle  
14 30 may be used to release the wheel from the fork. However,  
15 if the cyclist removes handle 30 while the wheel is locked  
16 in place to the fork, it would be extremely difficult for  
17 someone without the key to remove the wheel.

18

19 Attention is now directed to FIGS. 12 and 13, in which  
20 there is seen an alternate embodiment of a quick release  
21 assembly of the invention, generally designated by the  
22 reference character 100. In common with the previously  
23 described embodiment designated 20, the immediate embodiment  
24 shares handle 30, key 31, piston 32, bore 40 (FIG. 13), axle  
25 37, cap 34, cam 33 including cam body 45 and ends 50 and 51

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1 and keyway 56, clamp 58, spring 60, pin 63 and other common  
2 structural components. However, cam 33 is fabricated of  
3 magnetic material and key 31 is fabricated of iron or steel.  
4 The magnetism of cam 33 has the property of attracting key  
5 31. In this way, a bicycle incorporating assembly 100 can  
6 be used and ridden with handle 30 attached without risk of  
7 handle 30 inadvertently becoming detached from cam 33, with  
8 the magnetic coupling or engagement between key 31 and cam  
9 33 functioning to prevent handle from inadvertently becoming  
10 detached from cam 33. The only way to remove handle 30 is  
11 to pull on it with a force that is sufficient 31 to overcome  
12 the magnetic attraction between key 31 and cam 33, detaching  
13 key 31 from cam 33. Key 31 can be constructed from magnetic  
14 material and cam 33 from iron or steel if desired. Also,  
15 key 31 and cam 33 can each be constructed from magnets if  
16 desired for increasing the magnetic attraction between them.  
17 The magnetic attraction/engageability between key 30 of  
18 handle 30 and cam 33 is considered an alternate embodiment  
19 of a catch assembly of the invention. Because key 31 is  
20 considered part of handle 30, the magnetic coupling  
21 attribute of assembly 100 is considered between and  
22 facilitated by handle 30 and cam 33.

23

24 In sum regarding assembly 100, when key 31 is inserted  
25 into keyway 56 and key 31 of handle 30 is magnetically

1 coupled to cam 33, handle 30 is prevented from falling out  
2 of assembly 100. Accordingly, a cyclist can use the bicycle  
3 with handle 30 in place. When the cyclist wants to park the  
4 bicycle and remove the front wheel, handle 30 may be used to  
5 release the wheel from the fork. However, if the cyclist  
6 removes handle 30 while the wheel is locked in place to the  
7 fork, it would be extremely difficult for someone without  
8 the key to remove the wheel.

9

10 Attention is now directed to FIGS. 14 and 15, in which  
11 there is seen an alternate embodiment of a quick release  
12 assembly of the invention, generally designated by the  
13 reference character 110. Looking to FIG. 14, and in common  
14 with the previously described embodiment designated 20, the  
15 immediate embodiment shares handle 30, key 31, piston 32,  
16 bore 40, axle 37, cap 34, cam 33 including cam body 45 (FIG.  
17 15), keyway 56, pin 63 and other common structural  
18 components. However, assembly 110 is furnished with a catch  
19 assembly 111 that includes a pair of protuberances 120,121  
20 carried by cam 33 and a pair of detachably engageable  
21 recesses 122,123 carried by key 31. Protuberances 120,121  
22 are elongate, extend into keyway 56 along either side of pin  
23 63 and are the opposing sides of a U-shaped spring 124  
24 attached to cam 33. Spring 124 extends through openings  
25 125,126 formed into and through end 50 of cam 30, which

1 actually blend into recess 130,131 (FIG. 15) located at  
2 keyway 56 on either side of pin 63. Protuberances 120,121  
3 reside at recesses 130,131 and are biased toward or  
4 otherwise into keyway 56 away from recesses 130,131,  
5 respectively. Recesses 122,123 are located on either side  
6 of key 31.

7

8 Key 31 encounters protuberances 120,121 when inserted  
9 into keyway 56. Exerting a force against key 31 toward

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10 keyway 56 that is sufficient to overcome the bias of  
11 protuberances 120,121 allows key 31 to push protuberances  
12 120,121 away from keyway 56 forcing them into recesses  
13 130,131, respectively, allowing key 31 to pass thereby into  
14 keyway 56 until the point when protuberances 120,121  
15 encounter recesses 122,123, respectively. When  
16 protuberances 120,121 encounter recesses 122,123, the bias  
17 provided by spring 124 forces protuberances 120,121 into  
18 engagement into and against recesses 122,123, respectively,  
19 clamping and securing key 31 to cam 33, securing handle 30  
20 to cam 33 to prevent handle 30 from inadvertently falling  
21 away from cam 30. In this way, a bicycle incorporating  
22 assembly 110 can be used and ridden with handle 30 attached  
23 without risk of handle 30 inadvertently becoming detached  
24 from cam 33. The only way to remove handle 30 is to reverse  
25 the foregoing operation by taking up handle 30 and pulling

1 on it with a force that is sufficient 31 to overcome the  
2 bias provided by spring 124, detaching protuberances 120,121  
3 from recesses 122,123. The positioning of protuberances  
4 120,121 and recesses 122,123 can be reversed, with recesses  
5 122,123 carried by cam 33 at keyway 56 and protuberances  
6 120,121 (spring 124) carried by key 31 so as to extend  
7 outwardly of, and be biased away from, key 31.

8

9 In sum, when key 31 is inserted into keyway 56 and  
10 protuberances 120,121 engage recesses 122,123, respectively,  
11 handle 30 is prevented from falling out of assembly 110.  
12 Accordingly, a cyclist can use the bicycle with handle 30 in  
13 place. When the cyclist wants to park the bicycle and  
14 remove the front wheel, handle 30 may be used to release the  
15 wheel from the fork. However, if the cyclist removes handle  
16 30 while the wheel is locked in place to the fork, it would  
17 be extremely difficult for someone without the key to remove  
18 the wheel.

19

20 This specification discloses preferred embodiments of  
21 the invention. Those skilled in the art will recognize that  
22 although the various preferred embodiments of the invention  
23 are particularly useful in connection with bicycle wheels,  
24 they can be used for securing other removable parts of a  
25 bicycle, namely, bicycle seats to seat posts, seat posts to

1 bicycle frames, etc. Those skilled in the art will further  
2 recognize that changes and modifications may be made to the  
3 described embodiments without departing from nature and  
4 scope of the invention. Accordingly, any such changes and  
5 modifications to the preferred embodiments are intended to  
6 be included within the scope of the invention as assessed  
7 only by a fair interpretation of the ensuing claims.

8

9 Having fully described the various embodiments of the  
10 invention in such clear and concise terms as to enable those  
11 skilled in the art to understand and practice the same, the  
12 invention claimed is:

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